California Division of Mines and Geology

Fault Evaluation Report FER-9

July 8, 1976

1. Name of fault: Agua Blanca thrust and related faults.

2. Location of fault: Devils Heart Peak, Cobblestone Mountain, and Whitaker Peak quadrangles, Ventura County and a minor part of Los Angeles County.

3. Reason for evaluation: Part of 10-year program; zoned in Ventura County's Seismic and Safety Element (Nichols, 1974).

4. List of references:

a) Black, B.A., 1967, Geologic map of the Topatopa area: unpublished mapping for Shell Oil Company, scale 1:250,000. Remarks: In Jennings' file; this map is colored, but the units are unlabeled. Comparison with reference "d" shows that no Quaternary units are shown. Faults were modified for use in the L.A. Sheet (reference "d") by using reference "c".

b) California Division of Mines and Geology, 1976, Active fault mapping and evaluation program, ten year program to implement Alquist-Priolo Special Studies Zones Act: California Division of Mines and Geology, Special Publication 47, 42 p. Remarks: Appendix B, Policies and Criteria of the State Mining and Geology Board.

c) Crowell, J.C., 1966, Geology of the Santa Felicia-Canton Canyon area, Los Angeles and Ventura Counties, California: unpublished faculty research, University of California, Los Angeles, scale 1:14,000. Remarks: Best reference for this fault; in Jennings' file.

d) Crowell, J.C., McClure, D.V., Kienle, C.F., and Edwards, L.N., 1967, Geologic map of the eastern end of the Santa Ynez fault zone: unpublished field studies, University of California, Santa Barbara, scale 1:250,000. Remarks: In Jennings' file.

e) Jennings, C.W., and Strand, R.G., 1969, Geologic map of California, Los Angeles Sheet: California Division of Mines and Geology, scale 1:250,000.

f) Jennings, C.W., 1975, Fault Map of California: California Division of Mines and Geology, California Geologic Data Map Series, Map no. 1, scale 1:750,000.

g) Nichols, D.R., 1974, Surface faulting: in Seismic and Safety Elements of the Resources Plan and Program, Ventura County Planning Department, section II, p. 1-35, pl. 1.

h) Weber, F.H., Jr., Kiessling, E.W., Sprotte, E.C., Johnson, J.A., Sherburne, R.W., and Cleveland, G.B., 1975 (Preliminary draft of 2/27/76), Seismic Hazards Study of Ventura County, California: California Division of Mines and Geology, work in progress as a cooperative project with Ventura County.

i) Ziony, J.I., Wentworth, C.M., Buchanan-Banks, J.M., and Wagner, H.C., 1974, Preliminary map showing recency of faulting in coastal southern California: U.S. Geological Survey, Miscellaneous Field Studies Map MF-585, 15 p.,map scale 1:250,000, 3 photos.

5. Summary of available data:

The Agua Blanca thrust "zone" is classified as a secondary fault hazard zone in the Ventura County Seismic and Safety Element (Nichols, 1974), thus, this fault is considered for special studies zoning. It should be noted that Nichols, in the text of the report, only mentions the Agua Blanca thrust, by name, as one of the "most significant" of several faults in northern Ventura County; he says no more. Further, essentially all faults shown on Jennings and Strand (1969) were zoned in the element. I assume that no attempt was made by Nichols to determine which faults were active, potentially active, or inactive -- hence all were zoned in the element.

Weber, et al. (1975, p. 179) notes that the Agua Blanca thrust was not studied and, therefore, an age determination was not made.

Black (1967) and Crowell (1967) are reconnaissance mapping only, scale 1:250,000. These maps are not suitable for detailed zoning, showing no more detail than Jennings and Strand (1969). Jennings (1975) depicts the faults (addressed in this report) in black (not cutting Quaternary deposits).

The best data available is Crowell (1966, scale 1:14,000), figure 2 (at a reduced scale) in this FER. Several faults are shown by Crowell, including the Agua Blanca thrust, Blue Point fault, the Narrows fault, the Whitaker thrust, and numerous unnamed faults; these are all "zoned" by Nichols (1974). I have arbitrarily labeled the unnamed faults with letter symbols A through Z on figure 2. None of these faults cut Holocene or Pleistocene units, thus there is no evidence of active faulting (as defined in the Policies and Criteria of the Mining and Geology Board). In fact, the Narrows fault, a principal fault in this group, is depicted as not cutting Quaternary terrace deposits, suggesting that it is inactive.

All other faults shown by Crowell are either overlain by alluvial and landslide deposits (which may be less than 11,000 years old and, therefore, cannot be used as evidence of inactivity if not cut) or are not overlain by any young units. In this FER, it is assumed that all of the interfault relationships mapped by Crowell are correct ~~(all of~~ (which may not always be the case).

The youngest unit cut by the Agua Blanca thrust is the Modelo Formation (late Miocene). The north block is the upthrown block -- no dip is given. To the east the fault presumably becomes a reverse (?) fault and is shown dying out (on strike) in an unconformity at the base of the Modelo Formation.

Unnamed faults AB, CD, EF, and RS all are shown by Crowell as buried under landslide deposits of Quaternary age. The only unit cut by any of these faults is the Michael Formation (Eocene). These faults are relatively short, and I doubt that any have moved during the Holocene, however, their age can only be classified as post-Michael Fm. No other faults cross these faults nor do any other units except (very recent (?) ~~except~~ landslides) overlie them.

Fault GH is depicted as buried under landslide and alluvium (both Quaternary in age). This fault also cuts only the Michael Formation (Eocene) and also offsets the Narrows fault (discussed below). Thus, the only age that can be assigned is post Narrows fault, if the offset of the Narrows fault is real. If not, then post-Michael Formation is the only assignable age.

The Narrows fault is the only fault in the area which is capped by Quaternary terrace deposits. The only unit cut is Michael Formation (Eocene), however, fault interrelationships demand that the Narrows fault be dated at post-Rincon Formation (early Miocene) as well as pre-late-Quaternary. There is no evidence that this fault is active, and it is probably inactive under the Policies and Criteria set up by the Mining and Geology Board.

Two other faults are truncated by the Narrows fault. The Blue Point fault is buried by landslide and alluvium, and the youngest unit cut is Rincon Formation (Miocene). Thus, the Blue Point fault is post-Rincon Formation and pre-Narrows fault. This fault is, therefore, inactive. Likewise, fault VW is inactive since it is truncated by the Narrows fault; and faults Y and X are inactive since each is truncated by fault VW.

The unnamed faults between P and Q only cut Sharps Formation (Eocene) and do not disturb the overlying alluvium. These faults are primarily thrust faults (north side up relative to the south side), and the main branch offsets the Blue Point fault. Therefore, the faults are post-Rincon.

The unnamed faults between N and O are truncated by the Agua Blanca thrust. The youngest unit cut is Rincon Formation (Miocene); no younger units occur along the fault. This fault can only be assigned an age of post-Rincon Formation and pre-Agua Blanca thrust.

Fault JK is depicted as buried by landslide and alluvium (Quaternary). The youngest unit cut is Rincon Formation (Miocene). Thus, the fault is post-Rincon.

Fault LM is depicted as not cutting Quaternary alluvium and as cutting Modelo Formation (Miocene). The fault is truncated by the Agua Blanca thrust. Hence, the fault is post-Modelo Formation and pre-Agua Blanca thrust.

The Whitaker thrust fault (north side up) is depicted as not cutting landslide or alluvium. The youngest unit cut is Michael Formation (Eocene). This fault is offset by fault TU, also post-Michael Formation in age (the fault is overlain by alluvium).

Finally, fault Z is depicted in a strange manner. This fault is shown as entirely within a landslide. I believe this to be a displaced section of the Whitaker thrust fault, and not an active fault.

Ziony, et al. (1974), depicts the Agua Blanca thrust and the unnamed fault (LM of this report) as having moved sometime during the last 12 million years, but no minimum age is given. Ziony, et al. depicts the remaining faults as of unknown age.

6. Interpretation of air photos: Other than air photos which had cloud cover over this area, no air photos were readily available.

7. Field observations: Time did not permit a field examination of these faults. The area is closed by the U.S. Forest Service due to extreme fire hazard (not even foot travel is permitted).

8. Conclusions: Available data does not rule out movement of the Agua Blanca thrust fault during the Holocene or even the Quaternary, however, there is no evidence that such movement has taken place. ~~The topographic expression noted in item 6 (above) could be due to differential erosion.~~ Any evidence of faulting during the Quaternary may be obscured in the Quaternary deposits which do occur along the fault trace and, therefore, may have not been recognized. Thus, the only age which can be assigned is post-Modelo and pre-most-recent.

With respect to other faults, some of these are apparently inactive as noted in item 5 (above). The others cannot be proven inactive, however, there is no evidence that any of these faults have moved since Eocene or Miocene time.

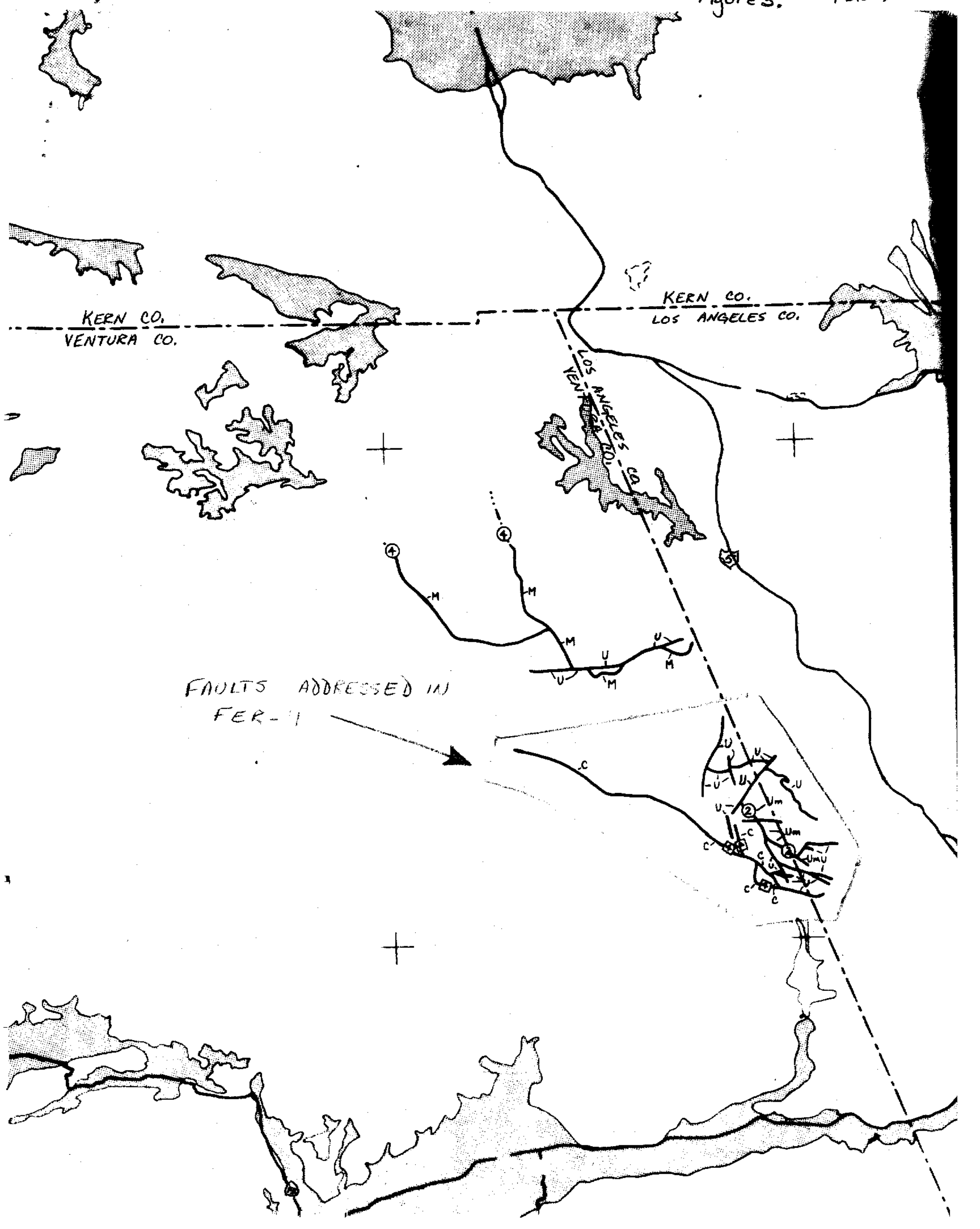
9. Recommendations: On the basis of the data noted in this report, zoning of these faults is not recommended. A further consideration is that these faults lie entirely within the Sespe Condor Sanctuary in the Los Padres National Forest, and, therefore, not likely to be open to development.

10. Investigating geologist's name, date:

Theodore C. Smith
Theodore C. Smith
Assistant Geologist
July 14, 1976

I concur with the recommendations.
EWH
7/16/76

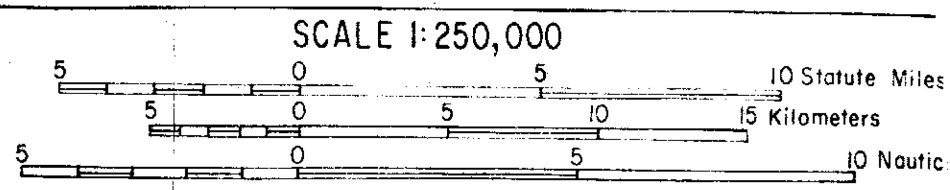
Figure 3. FER 9



FER 9 Figure 3 (continued)

EXPLANATION

(Modified from Ziony, et al., 1974)

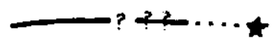


INTRODUCTION

This map portrays what is known about the time of latest movement along each mapped fault. Faults are shown by line symbols for location. Symbols superposed on the fault traces indicate known late Cenozoic stratigraphic or geomorphic evidence that brackets the age of the most recent movement for each fault. A fault is placed in one of eight age classes, shown by letter symbol or date, that most closely restricts the age of its latest movement.

MAP SYMBOLS

LINE SYMBOLS



Onshore fault

Queried where connection, continuation, or existence uncertain; dotted where inferred beneath covering deposits. Star indicates fault with relatively young movement along it but fault trace too short to show at map scale

GEOLOGIC CONTROL SYMBOLS

Indicate location and age of late Cenozoic geologic features that bracket the latest movement for each fault. Numbers within the symbols indicate the age of each geologic control as based on the generalized time spans of the age range chart; the youngest reasonable age is assumed for deposits whose age is uncertain

○ Oldest known unfaulted stratigraphic unit that is deposited across or intruded along the fault. Age of unit provides minimum limit on age of latest movement

□ Youngest known stratigraphic unit displaced by fault. Age of unit provides maximum limit on age of latest movement

◁ Fault-produced geomorphic feature. Age of feature provides maximum limit on age of latest movement

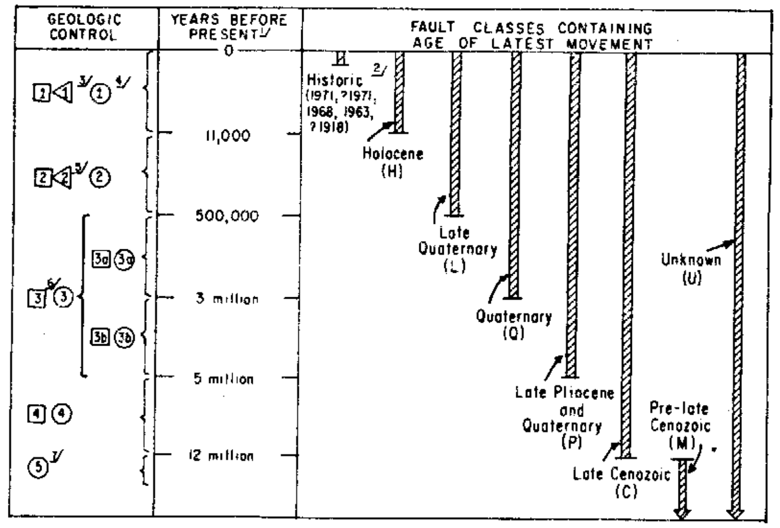
AGE CLASS SYMBOLS

Each fault is placed in an age class according to the time span containing evidence of its latest known movement and, except for historic faulting, is so designated by a letter symbol. A fault is assigned to one of eight age classes chiefly from the youngest known late Cenozoic stratigraphic or geomorphic evidence of faulting preserved along it. Faults lacking such evidence either are designated Unknown or are assigned to another class on the basis of geometric and spatial relations to a fault whose history is better understood. The entire length of a fault is assigned to a single age class unless contrary evidence is available

Class	Symbol
Historic	1971, ?1971, 1968, 1963, ?1918
Holocene	H
Late Quaternary	L
Quaternary	Q
Late Pliocene and Quaternary	P
Late Cenozoic	C
Pre-late Cenozoic	M
Unknown	U, Um

Seven of the eight age classes enclose progressively longer spans of time within which movement may have occurred (see chart). The time span containing the latest movement may be restricted further by unfaulted overlying deposits indicated on the map by minimum geologic control symbols. Faults lacking evidence of late Cenozoic movement are designated Unknown. If positive evidence exists that they have not moved for at least 12 million years, they are classed Pre-late Cenozoic; faults classed as Unknown (U) could have moved as recently as those of any other age class, except for those faults of unknown age with minimum age control (Um)

AGE RANGE CHART OF GEOLOGIC CONTROLS AND AGE CLASSES



1/ Years are approximate and are based in part on radiometric dates from strata in southern California. Column is not to scale

2/ Queried where nature of ground rupture is questionable. 1968 and 1963 events presumed to be man-induced faulting associated with oil field operations (see text)

3/ Geomorphic criteria for Holocene faulting: sag depression; offset stream course in Holocene deposits; linear scarp in Holocene deposits; or, linear submarine scarp in seafloor sediments above wave base

4/ Control from overlapping Holocene strata not shown on map except where such deposits are known to be at least 3,000 years old

5/ Geomorphic criteria for late Quaternary faulting: offset stream course in Pleistocene or older deposits; linear scarp in Pleistocene deposits; markedly linear steep mountain front associated with adjacent concealed fault trace; or, linear submarine scarp in seafloor sediments below wave base

6/ Numeral 3 designates nonmarine strata of late Pliocene to early Pleistocene age. Numerals 3a and 3b designate marine strata of early Pleistocene and of late Pliocene age, respectively

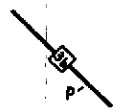
7/ Pre-late Cenozoic minimum geologic control consists of intrusive rocks about 12 to 20 million years old

GEOLOGIC UNITS

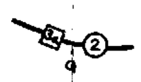
Chiefly bedrock at or near ground surface

Chiefly alluvial or terrace deposits generally more than 50 feet thick

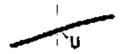
EXAMPLES OF AGE CLASSIFICATION AND LIMITING GEOLOGIC CONTROL



Fault is classed as Late Pliocene and Quaternary (P), indicating that its most recent movement occurred within the last 5 million years. Faulted marine strata of late Pliocene age (about 5 million to 3 million years) are present (square with numeral 3b) but minimum age control is lacking.

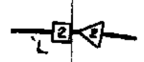


Fault is classed as Quaternary (Q). Faulted marine deposits of early Pleistocene age (about 3 million to 500,000 years) are present (square with numeral 3a) to provide a maximum limit on the most recent movement. Unfaulted deposits with an age between about 500,000 and 11,000 years (circle with numeral 2) constitute a minimum limit on latest movement.

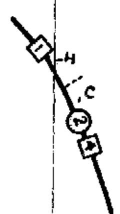


Fault is classed as Unknown (U) because no faulted late Cenozoic deposits are preserved along it. A minimum limit on age of movement is lacking.

Fault is classed as Unknown with minimum limit on age of latest movement (Um). No faulted late Cenozoic deposits are preserved along it, but the latest movement predates unfaulted early Pleistocene marine strata between about 3 million and 500,000 years old (circle with numeral 3a).



Fault is classed as Late Quaternary (L). Maximum age control is provided both by fault-produced geomorphic feature (triangle with numeral 2) and by faulted rocks (square with numeral 2) with an age between about 500,000 and 11,000 years. Minimum geologic control on the age of the most recent faulting is lacking.



Segments of fault are assigned to different age classes. Segment classed as Holocene (H) is known to displace deposits younger than 11,000 years (square with numeral 1). Other segment displaces rocks between about 12 million and 5 million years old (square with numeral 4) but is limited by unfaulted deposits from about 500,000 to 11,000 years old (circle with numeral 2), and thus is classed as Late Cenozoic (C).